AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY

Vol. 27 MARCH, 1950 No. 3

GERIATRICS AND OPTOMETRY*

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INTRODUCTION

An increased interest in the science of geriatrics has been evident in recent medical literature. This is due to the lengthening life span and the subsequent problems accompanying an aging population. The patient past 50 also constitutes a large part of the average optometric practice. In the years to come, the care of the aged will assume increasing importance to our nation as a whole and the profession of optometry specifically.‡

The care of the patient past 50 obviously requires a different approach, both medically and optometrically. Additional visual measurements are necessary for patients who have reached middle age. The diagnostic significance of certain tests varies considerably with age. The final prescription and advice to the patient past 50 should be based on the physical and mental changes which accompany the process of aging. It must be kept in mind that as a profession we are treating individuals and that any general conclusions reached in the discussion must be modified in specific cases for individual differences.

It is the purpose of this paper to present an outline of geriatrics and to emphasize the importance of certain geriatric principles to the field of optometry.

HISTORY OF GERIATRICS

The evidences of pathologic changes which accompany old age have been described as far back as Hippocrates. In addition to changes

*Read before the annual meeting of the American Academy of Optometry, Cleveland, Ohio, December 10, 1949. For publication in the March, 1950, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

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‡Part two of the paper, "Geriatrics and Optometry," entitled "Visual Changes with Age," will appear in the April issue, and the concluding part of the paper, "The Visual Examination of the Patient Past Forty," in the May issue.

of general interest in the field of medicine he emphasized "defluxions of the eyes and of the nose, dimness of sight, cataract, glaucoma, and dullness of hearing," as being typical diseases of older people.

Roger Bacon in the thirteenth century wrote one of the first books on old age. The title was, "The Care of Old Age and the Preservation of Youth." It was originally written in Latin and in 1683 was translated into English. Even at that time Bacon was working on alleviation of the problems of presbyopia. He describes a lens which he made as "useful to old men and those which have weak eyes for they see the smallest letters magnified."

The first text on the treatment of diseases peculiar to old age was "Medicina Gerocomica" written in 1724. Floyer, the author, emphasized the value of moderation in everything. His book formed the basis for the foundation of geriatrics and was followed by many works in England, Germany, and France in the nineteenth century.

PRINCIPLES OF GERIATRICS

Nascher first coined the term "geriatrics" in an article in the New York Medical Journal in August, 1909, according to Freeman.[1] In an introduction to Thewlis' book on geriatrics which appeared in 1919 he outlined the principles of geriatrics as follows:

1. Senility is a physiologic entity like childhood; not a pathologic state of maturity.
2. Diseases in senility are pathologic conditions in a normally degenerating body; not diseases such as occur in maturity complicated by degeneration.
3. The object of treatment of diseases in senility is to restore the diseased organ or tissue to the state normal in senility; not to the state normal in maturity.

It is interesting to note that Jacobi, one of the pioneer pediatricians, wrote the introduction to Nascher's book on geriatrics. This was a natural trend as pediatricians were the first to realize, as Stieglitz[2] so aptly puts it, "that the child is not the little man, but presents structural, functional, chemical, metabolic, nutritional and psychologic characteristics peculiar to his biologic age." Stieglitz then emphasizes that this concept is equally applicable to geriatrics.

It is not enough to excuse our inability to solve visual problems by blaming it on old age. It is important that we recognize which changes are normal to aging and which are indicative of a true pathologic change. It is also important that as optometrists we treat the patient's visual problems as a part of the general aging physical condition.

Most authorities now believe that geriatrics begins at approximately 40. Some go so far as to say that we should begin conditioning

[1]Freeman, Joseph T. History of Geriatrics. Ann. M. Hist. 10:1938. p. 324.
[2]Stieglitz, Edward J. Geriatric Medicine. W. B. Saunders Co. Philadelphia, Pa. 1949. p. 28.

ourselves at 35 so that our life past 40 can be adjusted as easily as possible. After 40 some approximate divisions have been made for purposes which become obvious as our study progresses. The age from 40 to 60 is known as the period of later maturity, from 60 to 75 as the period of senescence, and from 75 on as a period of senility. Stieglitz, Thewlis, and Boas, three students of geriatrics, agree that the individual varies in reaching these periods, plus or minus five years would take in most exceptions. From 50 on is generally considered the period of geriatric treatment. This age is also a turning point in optometric treatment, as very few of our patients pass this mark without a reading addition of some kind.

FACTORS INFLUENCING LONGEVITY

Some general factors influencing longevity are heredity, environment, infections, diet, and the use of common drugs such as alcohol and tobacco.

The influence of heredity on aging must be considered carefully. As Oliver Wendell Holmes said: "If you are set out to achieve three score years and twenty, the first thing to be done is, some years before birth to advertise for a couple parents both belonging to long lived families." Boas[3] states that each organ has its own time curve of aging and that the most important factor influencing this is heredity.

In the eye there are several diseases which progress later in life as a result of heredity. Certain types of cataracts, Lebers disease and glaucoma are among the examples.

Hereditary cataracts, while by no means common, occur often enough that they have been studied for a number of years. Tassman[4] cites the study of Nettleship dating back to 1905. He offers six rules which seem to apply to most cases.

1. The descent is direct. No generations are skipped but children of a family not having cataracts can feel assured that none will develop.
2. If children in one family have cataracts, the liability of the next generation is increased.
3. Transmission from like sex to like sex is most common.
4. The cataracts tend to appear earlier in life in succeeding generations.
5. The age of onset is approximately the same in persons of the same generation.
6. The families with cataracts are not affected as to fertility, health or longevity.

As this paper is devoted mainly to complications occurring later in life, it is enough to mention only that glaucoma may occur as a hereditary condition but not necessarily. Any history of glaucoma in

[3]Boas, Ernst P. Treatment of the Patient Past Fifty. Year Book Publishers, Chicago, Ill. 1947. p. 21.
[4]Tassman, I. S. The Eye Manifestations of Internal Diseases. C. V. Mosby Co., St. Louis, Mo. 1942. p. 214.

the family should be recorded and intraocular tension checked at intervals.

Any history of blindness in the family should call for a careful ophthalmoscopy. The eye, as any other organ of the body, inherits certain weaknesses which are not apparent until later in life. Another cause of blindness occurring later in life is Lebers disease or hereditary optic neuritis. It can occur up to as late as 40 years of age although occurring often in young adults. It reveals the symptoms of optic atrophy and can be traced through several generations.

Dublin[5] says a favorable home environment is more important than heredity in promoting longevity. Here again it is difficult to separate heredity and environment. Premature death of parents means that children are not so well housed, fed, or clothed. This may mean working in unskilled labor with less pay and increased accident chances.

Stress which is brought about by an unfavorable environment has considerable effect on longevity. Stress is defined as an overpowering pressure or influence. Stress can be felt by an organism either because of external causes or internal causes. Few people are willing to admit deterioration. A patient of 50 attempting to do the things he did at 20 finds himself as a result under stress. The diseases so common to middle age are aggravated considerably by stress. Examples are cardiovascular disease, diabetes, asthma, diseases of the digestive system, etc. One of the results of stress is loss of appetite with resulting nutritional deficiency. Loss of sleep from stress is another factor affecting the metabolism. Stress also makes it difficult to properly diagnose certain defects. It must be considered in history of all ocular complaints. A symptom such as a headache, mainly due to visual causes, can be distorted if recent stresses or strains are not considered. This is more prevalent in the 40 to 60 age group.

Minor infections undoubtedly play an important part in longevity. Many infections in early life have pronounced effect later. It is important to remember that recovery from infection at any age should be complete and as quickly as possible to assure the least damage to a vital organ. While optometrists do not treat infections of the eye they are responsible for referring large numbers of them to medical practitioners. They also have a moral obligation to the patient to see that recovery is complete and to follow the case through to completion.

The diet throughout the life of the individual not only affects his

[5]Dublin, L. T. Statistical and Social Implications in the Problem of our Aging Population. The Diplomate. 13. 1941. p. 227.

longevity but his enjoyment of the senescent period as well. One has only to study a few life insurance statistics to see the effect of obesity on the life span. Insurance studies show that the normal weight at age 25 is the best one to maintain throughout life and that in general increases in weight which are common after 30 are not desirable. Underweight may be a symptom of disease. Any patient experiencing a sudden loss of weight or persistent underweight should be referred to a physician as it is difficult for the average person to determine the cause. Dietary fads and customs of various people influence longevity unfavorably to some degree.

The use of drugs such as alcohol and tobacco have many champions, both on the sides of longevity and shortening the life span. Probably the most complete studies on the subject have been made by Raymond Pearl[6] who showed that those who took moderate amounts of alcohol each day live longer. According to Thewlis[7], Pearl's studies also showed that excessive smoking shortened life up to 70. After 70 smoking in moderate amounts does not affect mortality. Color field work of men such as Brombach shows that excessive use of tobacco does affect field of vision for color. In general, however, men past 60 should not be deprived of tobacco except in rare cases.

PHYSICAL AND MENTAL CHANGES OF NORMAL AGING

The exact cause of age changes in the human body are still obscure. It is difficult for example to tell just what proportion of aging is due to heredity, or what is due to the normal accidents of living. We can examine briefly, though, changes which take place in most human organisms as they age.

Carlson, in his chapter in Stieglitz's book on "Geriatric Medicine,"[2] lists nine progressive age changes not yet shown to be due to specific diseases:

1. Gradual tissue desiccations. . By determining the electrolyte concentration in the tissue cells, some doubt has been raised as to the reliability of the older experiments which seem to establish a gradual tissue desiccation as part of the aging process.
2. Gradual retardation of cell division, capacity of cell growth and tissue repair, including reduced capacity to produce immune bodies in case of infection.
3. Gradual retardation in the rate of tissue oxidation (lowering of the natural metabolic rates).
4. Cellular atrophy, degeneration, increased cell pigmentation, and fatty infiltration.
5. Gradual decrease in tissue elasticity, and degenerative changes in the elastic connective tissues.

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[6]Pearl, Raymond. in Starling, E. H. The Action of Alcohol on Man. London, England. Longmans, Green & Co. 1923.

[7]Thewlis, Malford W. The Care of the Aged. C. V. Mosby Co. St. Louis, Mo. 1946. p. 41.

[2]Stieglitz, Edward J. Geriatric Medicine. W. B. Saunders Co., Philadelphia, Pa. 1949. pp. 49-66.

6. Decreased speed, strength, and endurance of skeletal neuro-muscular reaction.
7. Decreased strength of skeletal muscles.
8. Progressive degeneration and atrophy of the nervous system, impaired vision, hearing, attention, memory, and mental endurance.
9. Gradual impairment of the factors which in a normal person in his early years maintain a fairly constant internal environment for the cells and tissues.

A summary of the normal changes found to exist in various organs of the body as outlined by Carlson follows:

DIGESTIVE SYSTEM

The salivary glands atrophy and while they are not vital for the life span might have an effect on tooth decay. The volume and acidity of human gastric juice decreases definitely with age. Degenerative changes are apparent in the pancreas in most old people. In this respect it is interesting to note that the incidence of diabetes increases with advancing years but it is also found in young people. This would indicate that this phase of the pancreas is probably due to hereditary weakness rather than accidents of living. Carlson quotes Ivy as saying, "Death in the aged is apparently only rarely due to wearing out of the organs of the digestive system. In the absence of gastro-intestinal cancer or local toxic or infectious processes, the digestive system seems capable of functioning beyond the ordinary life span."

THE CARDIOVASCULAR SYSTEM

Failure somewhere in the cardiovascular system accounts for the largest number of deaths in persons past 50. At the same time the cardiac and blood-vascular departments may be efficient well past the one hundred year mark. Instead of atrophy in the heart there is an actual increase in the size and weight. There is, however, a normal decrease in elasticity of the heart valves as well as an increased calcium deposit in them. There is a lessened blood supply through the terminal vessels and in organs such as the eye this results in under-nourishment in later life. The saying, "A person is as old as his arteries," is nearly true. There is an increased calcification in all arteries in all people with advancing years. Carlson says that these "aging degeneration or disease factors do not appear to the same degree in all arteries at the same age in the same individual, or to the same degree at the same time in different individuals." This explains the apparent "sclerosed appearance" of vessels in the eye in a few patients who have no other symptoms of general arterio sclerosis. The work of Dragstedt indicates that the main factor in arterio sclerosis is faulty fat metabolism induced by deficiency in hormones from the pancreas. In view of this work considerable progress can now be made toward the solution of this problem.

THE KIDNEYS

The kidneys show loss of weight after 40 and an inability to throw off injuries by poisons. Their regeneration power after injuries is also lessened. The importance of the kidneys to the aging organism is realized when we recognize that corrosion of the renal link is a factor in hypertension. As the kidneys are vital to the health of the entire body any loss of their function results in a depletion of the reserves in all organs and seriously weakens the life of the aged, years before their death.

SOME GENERAL CHANGES

There is a gradual loss of hearing, especially on high tones. The loss of teeth beyond the sixty-fifth year is quite common but is probably a matter of heredity and faulty nutrition in most cases. There is little measurable change in the blood or in the lymph system. The changes in the skin are obvious in most older people and the cosmetic significance of the changes in hair are out of proportion to their scientific value. It is interesting to note that at the age of 60 the same skin wound requires five times longer to heal than in a child of 10. The bones of man become more brittle with years but not with an equal rate throughout the body.

MENTAL CHANGES

Due to the importance of mental changes to the field of visual problems more space has been devoted to this important aspect of aging. Johnson[8] states that it was long thought that damage to the structure of the brain must inevitably injure the mind, and that the extent of organic change determined the amount of mental impairment. It has been found that considerable cerebral arterio sclerosis is compatible with normal mentality. Johnson goes on to say that the man who possesses a well-integrated personality, who takes life philosophically, and who has a wide range of interests is likely to keep his mental facilities to a far greater degree than is one who is not so well adjusted.

Some of the mental changes accompanying aging are irritability, loss of memory (especially recent events), a tendency to sleep less, loss of self-confidence, despondency, and a dislike of change. These are discussed fully in an excellent book, "The Years after Fifty," by Wingate Johnson. This book is written for the layman and gives some practical advice on growing old gracefully. It can be recommended to any patient past 40 for easy authoritative reading.

The two characteristics of irritability and dislike of change are

[8]Johnson, Wingate M. The Years After Fifty. Whittlesey House, McGraw-Hill Book Co., Inc., New York. 1947. p. 113.

important from a practical standpoint to our profession. The tendency to be irritable is often due to fatigue which can be avoided by sufficient sleep and frequent rest periods. It might be worthwhile on a problem case who has difficulty making a visual adjustment to check on this phase of aging. There seems to be ample reason for dislike of change in older people. The older organism seems to have trouble making adjustment to any extreme change. It might be argued in many cases whether this is an actual physical problem or a matter of habit. In most organs reserves are depleted from the scars of living which would reduce adaptability in older people. The importance of this in visual corrections will be considered in detail in a later section.*

Recent investigations present evidence of atrophic and degenerative changes to a measurable degree in both the central and peripheral nervous system. In agreement with this many separate investigators show lower results on intelligence tests with advancing age starting around 40. Learning also shows a drop around this age level although experimental evidence supports the formulation that no one is too old to learn. Sensory and motor ability are seen to decline in most cases starting at even an earlier age than the strictly mental characteristics. As discouraging as these events seem to the aging individual, though, they must not be overrated. These handicaps are usually compensated for by mature judgment which results in greater speed of correlation and better evaluation of new experiences.

*Part two, "Visual Changes with Age," will appear in the April issue.

ABSTRACTS

ANISEIKONIA FOR DISTANCE AND NEAR VISION. Kenneth N. Ogle and Wendell Triller. Am. J. Ophth., 32 (12), 1719-1724, Dec. 1949.

The design of the eikonometer and the reduction in examination time made it important to investigate to what extent differences between distance and near aniseikonic measurements are significant.

The data on 115 patients examined on both the standard (direct-comparison) eikonometer and on the space-eikonometer at the Dartmouth Eye Institute before its closing in 1947 are presented in this report. A brief description of both techniques is included.

In general, a study of the data available shows that the aniseikonia measured at near is essentially the same as that measured for distance vision, within the precision with which the measurements can be made.

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HISTORY OF THE SAFETY MOVEMENT*

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Many thousands of years ago when man was struggling to survive from one day to the next, his every movement was governed by the will to live. Self-preservation was the first law of the existing forces of nature. Dangers beset him at all times and only the strong survived to continue the progress of our human race.

Through the years the pageantry of history unfolded the story of man . . . of his increase . . . of his growing power and control of the earth. Men, with their families, banded together for mutual protection against natural dangers or hostile forces of other men.

Molded by centuries of the same climatic conditions and intermarriage, these bands increased and developed into races with a common racial characteristic in body, speech, and beliefs. Some races were dominant over their neighbors by virtue of superior numbers or more advanced development of natural resources and the achievement of its people in fighting and learning.

For example: the history of Egypt was the domination of slave races by the strong ruling race, the history of Athens as a dominant world power and the light of learning in the world of its time, and then, Rome, with all its glory and conquering legions.

Behind the scenes of this moving drama of civilization were the men who toiled to produce the weapons of war and the necessities of peace. Armourers, bakers, weavers, saddlers, blacksmiths, and hundreds of other craftsmen were represented. Most of these were employed by the ruling class of the time or they had small shops or used their homes as workshops.

The movement of civilization continued northward in continental Europe in company with the armies of the conquering nations. War changed the map of Europe time after time but it forced progress.

In the path of this tide was the island home of a race whose people were destined to control other lands and other races throughout the world. The years brought strength and power to this island nation

*Read before the New Jersey Chapter, American Academy of Optometry, Trenton, New Jersey, as one of a series of lectures on occupational optometry. For publication in the March, 1950, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.
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we call England. Her fighting ships gave her rule of the seas and her merchant ships brought wealth to the island shores. English land armies played a major role in the defeat of Napoleon and England became a world power.

MACHINES REPLACE HANDPOWER

Until the latter part of the eighteenth century the English craftsmen were using primarily the same methods as did the ancient craftsmen. They did find many improvements and became highly skilled but the crafts were all handwork and it took many years to produce a skilled workman. The amount of production was low, therefore the products were expensive. Most of the people did not benefit from the skill of the craftsmen for only the wealthy could afford to buy.

With the discovery of the successful application of steam power for the operation of machinery came a turning point in the use of the crafts. Unskilled workmen could be taught in a relatively short time the operation of powered machinery. The output was so much greater and the cost of the finished product so much lower that the craftsmen could not compete. Factories came into being and the Industrial Revolution in England had its start.

Many years were to be needed for the transformation from handwork to machines and the factory system: but the change could not be stopped for the great majority was to benefit.

EARLY AMERICA AND THE BEGINNING OF AMERICAN INDUSTRY

From England in an earlier century had gone colonists to settle in the new land. They were in search of freedom and a new way of life. The early American colonists could not leave in England that ingrained way of life of the mother country. Their lifetime training, experience and habits made it natural for them to look to England even after they had won independence from her rule. So, the industry that was to be born after they left, would follow them and become a part of the American way of life.

The early colonists first settled in the New England section of our country. They followed the natural pattern of building their homes near one another. Small settlements first grew up along the seaboard and rivers. The land had to supply their needs, so the growing of food was most urgent. The people had to become self-sufficient, for supply ships took months to reach them. Farming became the chief occupation and in order to find enough farmland it was necessary for the families to spread out away from the settlements.

As the country became settled by the original colonists and their

descendants, the growing population was supplemented by peoples from Europe. Immigrants arrived from England and other countries on the continent. They were drawn by the vision of a new land of opportunity or they were driven from their native homes by unbearable living conditions.

Merchants and tradesmen settled in the growing towns and villages. Sailing men went to sea to carry the furs, foods, and other articles for trade. Fishermen added to the food supply and founded a thriving industry. The land promised rich reward to the industrious and great areas were still to be explored.

Over all this bright, new land a shadow of strife was falling. These people had endured hardships in the beginning, so that they might find freedom of religion and of life. The heavy hand of the old government still ruled them and this was unbearable to many. The new land had made the people fight to survive, so most of them were ready to fight to be free. Years of fighting in the Revolutionary War gained freedom from foreign rule for the people and fused the colonies into the United States.

The remaining years of the eighteenth century were a period of formation and expansion. Many changes took place and the country was soon to become part of the world of nations. The centers of population grew from villages to towns and the original seaboard settlements had reached a size large enough to be called cities. Domestic and foreign trade was thriving and within 25 years after the turn of the new century, power-driven machinery had made its appearance. The first recorded factories were textile mills that were located in the New England section.

Two centuries after the arrival of the first settlers, the machines of industry followed. This introduction of machinery was to change living conditions in America just as it had done in England and the continental countries.

NINETEENTH CENTURY AMERICAN INDUSTRY:

INDUSTRIAL SAFETY BEGINS

The establishment of factories followed the same general path that the settling of the country had taken. Locations that were convenient to the population centers to supply people to work in the factories were chosen by the early mill owners. Navigable rivers and good roads were desirable for the transport of raw materials and the finished product.

Textile mills were among the first to make up a major industry and they were located chiefly in the New England states. The cotton

gin invented by Eli Whitney during the latter years of the eighteenth century had a marked effect on the development of the textile industry in this country.

Other industries came into being as a result of the rapid growth and expansion of the country. Tanneries and leather-working plants, saw mills and wood-working plants, mines and steel mills, railroad systems, oil fields and refineries, and hundreds of others necessary to keep pace with the growing nation.

War between the states in the 1860's mushroomed the growth of industrial plants just as war would do in the century that followed.

As the factory system in England had degraded and even broken the bodies of its workers, so did these early American industrial plants. Because they took it for granted that a certain number of lives must be sacrificed to the machines, most of the men who built these factories dismissed a violent death or maiming as an inherent risk that the worker must assume when employment was accepted. There is reason to believe that the workers themselves shared that same blind philosophy about the many bloody accidents that occurred.

Not all mill owners were insensitive enough to be satisfied to ease their conscience by small gifts of money or the payment of medical or burial expenses. But that was the accepted practice and so be it. This shameful condition was destroying the essential dignity of man and it did not escape the attention of the religious leaders and other humanitarians of the time.

As a result of the expressed public indignation from the pulpit and the press, legislators were compelled to pass some law to enforce industrial reform. The first law in America intended to prevent industrial accidents came from the New England section where the first industries were founded—Massachusetts, in 1867, provided for the inspection of factories. Thirty-three years before, England had inaugurated just such a law.

This initial step in legislative control and correction was followed by needed and better laws. As an early leader in the adoption of industry, it was fitting that Massachusetts be a leader in accident prevention legislation. In 1869 that state's government established a Bureau of Labor Statistics to determine the kinds and causes of accidents and in 1877 passed a law that required the guarding of dangerous moving machinery. Other states in the union took heed and more laws were made and put into operation. An employers' liability law passed in 1885 by the state of Alabama, was another forward stride by state governments.

Immediate correction of industrial hazards was not effected by this early legislation but many reforms were accomplished. It was the beginning of legislative action and the recognition of a need for laws to prevent accidents in industry.

A few leaders of industry were discovering the value of safety in their plants. An early recorded leader in the practice of accident prevention was the Illinois Steel Company. The original writers on the industrial safety movement have named its Joliet Works as the first industrial plant to initiate safety inspection in an attempt to prevent accidents.

SAFETY IN THE TWENTIETH CENTURY

The turn of the century found the United States an industrialized nation. Farm workers had left the farms to go into the factories. A flood of immigrants from foreign countries had made the supply of labor plentiful and cheap.

With a few exceptions, the general condition of the factories, mines, and other industries was little improved over earlier times. Not much attention was given to lighting, sanitation, or other health measures in an effort to improve production and prevent accidents. Machinery was not designed for most efficient operation, dangerous points of operation were not guarded, and as a result the accident rate increased with the increase of industries. A medical examination before employment was not a general practice and the physically unfit contributed to the high accident rate. Liability laws in force were inadequate to compel any improvements for accident prevention.

Employers' liability laws of this period were worded so that the results left much to be desired. If an injured worker tried to obtain compensation for his injuries and medical care, he had to prove that his employer was negligent. Lawyers' fees, court costs, and the politically powerful employer against him usually prevented any individual worker from filing suit in court. Even if he had been successful in carrying his case to court, the law would have been on the side of the employer. Under the liability laws the employer was not responsible other than for "the exercising of reasonable care."

In addition to support from the press and religious leaders, the workers were developing strength through union. Labor unions added their voice to the cry for legislative correction. The industrial countries of Europe had already passed compulsory compensation laws that set an example for American law makers.

Maryland was the first state to pass a compensation law in 1902 but it was impractical in application. The Federal Government passed

a limited compensation law for federal employees in 1908, but it was not until a few years later in 1911 in the state of New Jersey that the first compensation law to achieve any lasting results was put into effect. This Workmen's Compensation Act voided the provisions of the old liability laws by awarding compensation to the injured worker regardless of fault.

Now there was a very real value to industrial safety. If an accident were to have a price ticket on it, then the employers knew that some practical measure must be taken to minimize or eliminate that cost. The first thought of most factory owners was how they could secure protection against the enforced payment of excessive compensation costs. Thus, the insurance companies were called into the picture and they began writing casualty insurance policies for manufacturers.

In this entirely new field it was necessary for the insurance companies to establish some rate or procedure on which to base the costs of the insurance to the employer. Insurance men went into the plants to get this information and in the course of their work they discovered many of the reasons for industrial accidents. This early accident analysis supplied the needed practical information for application in industrial accident prevention. The insurance inspectors became expert in safety work through investigations and experiences in the field. Much of what we know about accident prevention today comes from the work that was done by the insurance companies in industry.

In the mining industry the death rate was brought to the attention of the public with greater force, because a mine accident usually was a catastrophe. Pressure of public opinion resulted in the formation of the Bureau of Mines by the Federal Government in 1910. The objective of the Bureau was to correct health hazards and prevent explosions and other accidents in the mines. In addition to its commendable accomplishments in making the mines safer places in which to work, the Bureau has set up standards for protective equipment and for safe working practices that are applicable to almost all industry.

An early volunteer safety organization was the American Museum of Safety in New York City. It was founded in New York in 1908 under the auspices of the American Institute of Social Sciences. The original name was the American Museum of Safety and Sanitation, but the name was shortened in 1911 when it was incorporated under New York State law. Much of its earlier work has been absorbed by other safety organizations.

In 1913, a National Council for Industrial Safety was formally organized. This council was the result of a recognized need for better

methods of industrial accident prevention by the steel industry, insurance companies, and the engineering profession. The Council had its inception in the Association of Iron and Steel Electrical Engineers that was organized in 1907. Representatives from these groups and from the Federal Government aided in the formation of the Council. The original intent of these men was to promote accident prevention in industry but the need for its work in all phases of public life was so great that in a few years its activities were greatly expanded. In 1915 the original name was changed to the National Safety Council to comply with its safety work in all fields.

Since its organization the influence and work of the Council has grown to cover the nation and the world. Through its contributing agencies it has gathered a great volume of records and reference material on safety in its files at Chicago. This material is available to everyone interested in safety. A full-time staff is necessary to carry out the work efficiently, but the Council remains a non-profit organization with much of the work contributed by volunteers. Annual membership fees from member industries are the chief financial support of the Council.

One of the many constructive features of the Council is the National Safety Congress that it sponsors each year. It is a meeting of representatives of industry, the professions, the safety field, and all other interested groups. The purpose is to learn and to discuss the newest and potential accomplishments in the field of universal safety.

Six magazines are published each month by the Council for special application to safety work. They are "The Safe Worker," "The Safe Driver," "Safety Education," "The Industrial Supervisor," "National Safety News," and "Public Safety." Industries that are members of the Council submit accident figures and reports for the compilation of national accident rates. Insurance companies aid by contributing much necessary information so that the "Accident Facts" pamphlet prepared by the Council presents a comprehensive record of accident rates for the nation. "Safe Practices" pamphlets, rule books, safety posters, and the Safety Congress Report are more examples of the literature published.

State and local safety councils were formed in the years that followed the organization of the national group. These branches were able to carry on the safety work in their communities with a greater efficiency because they were smaller and the administration was in the hands of men who were leaders in safety work in those communities. Requirements for membership of any local or state council in the National Council were set high enough so that the high standards of the Council's work would be maintained.

A few examples of early local safety councils in progressive and effective operation are those founded in New York, Newark, and Philadelphia.

In the state of New Jersey, in 1947, a New Jersey State Safety Council was organized. Its purpose was to coordinate the safety activities of the local organizations in all fields of safety.

During the years of development of the safety movement many more organizations were founded than the few that have been mentioned. Each one of these groups had a specialized application for its efforts, but the collective aim was for the betterment of national safety and health.

The government agencies, both federal and state, played leading roles in the industrial and public health and safety movement. Their work during the years of the second world war contributed to a great extent to the success of the war production program. It is well to remember that these agencies received unmeasured assistance from the many other safety organizations with much of the help on a volunteer basis.

For general information some of the government agencies are listed:

National Bureau of Standards—Organized in the Department of the Interior in 1901 this bureau set up standards for foods, drugs, and most of the manufactured products. The work it has done in accident and fire prevention through the development of its standards has been a valuable contribution to the safety movement. Most of its work intermeshed with that of the American Standards Association.

Interstate Commerce Commission—An early organization, 1887, founded to aid in the prevention of railroad accidents. The commission controls the movement of freight carriers between states and over the land borders. Increased use of the interstate highways by buses and trucks made the work of the commission greater in setting up codes for safety equipment and safe operating practices.

Bureau of Labor Statistics—A part of the United States Department of Labor. Since its organization in 1913, the bureau has been a clearing station for information and statistics on industrial accidents and health.

Division of Labor Standards—Part of the United States Department of Labor. Created in 1934 with the purpose of bettering the standards and working conditions of the workingman. The work of this division shortly before and during the war was particularly important. Conservation of manpower to keep a full volume of war production flowing was vital. This division played a leading role in the safety training of war-time key workers and supervisors in industry.

Division of Industrial Hygiene—Created in 1912 as part of the United States Public Health Service to study hazards in industry, find remedies, and distribute this information to the various health departments in the country.

State Departments of Labor and State Departments of Health—The history of the safety movement reveals that the state governments were and are leaders in safety and health work. Two examples are the New Jersey Departments. Their accomplishments in the fields of industrial accident prevention, industrial health, workmen's compensation, and public health are worthy of praise and on a par with the best in the nation.

The founding of fire protection associations took place early in the history of the nation. In 1866 the National Board of Fire Underwriters

was organized and before the end of that century the Underwriters Laboratories and the National Fire Protection Association were founded. These organizations are dedicated to the prevention of uncontrolled fires and to fire safety. The fire toll in the United States might have given a different turn to our history if it had not been for the efforts and work of these groups.

Any history or outline of the American Safety Movement should include the following safety and health organizations. They have contributed and are continuing to work for universal safety and health. Perhaps some groups will be omitted for the listing is not complete.

American Society of Safety Engineers
Industrial Association
Saranac Laboratory for the Study of Tuberculosis
Accident Prevention Department Association of Casualty And Surety Companies
American Standards Association
National Society for the Prevention of Blindness
American Industrial Hygiene Association

The safety movement in America has come a long way in a comparatively short time. Much work is necessary to further the accomplishments that have been made. New fields of endeavor are opening each year, new sciences that will start new industries.

What we accomplish today will help to make a safer tomorrow.

REFERENCES

Heinrich, H. W., "Industrial Accident Prevention," McGraw-Hill Book Company, Inc., New York and London, 1941.

Wittekind, J. R., "A Brief History of Industrial Vision," American Optometric Association Public Health Bureau, 1942.

ABSTRACTS

SUBJECTIVE RETINOSCOPY. Joseph I. Pascal. Optometric World. 37. 48-50. 81. June, 1949.

Various applications of subjective tests based on the principles of velono-skiascopy are discussed. The most important is the Streak Test for checking the amount of astigmatism. The eye is slightly fogged and a thin wire cross is held before the patient or placed in the trial frame. The target consists of a white cross on a red background. The direction of the wires in the wire cross and the white lines on the target are set to correspond to the cylinder axis already found.

The patient sees a red streak running through each white line. If the streaks are of equal width the astigmatism is fully corrected. If the streaks are of unequal width a minus cylinder is added with its axis along the wider streak to equalize the two streaks.

R. E. B.

COMBINED EFFECTS OF SPHERICAL ABERRATION AND DIFFRACTION ON THE RETINAL IMAGE*

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INTRODUCTION

The purpose of this paper is to describe a method of computing the combined effects of spherical aberration and diffraction on the blurredness of the retinal image of a monochromatic (589 mμ) point source located on the optic axis of an eye which has a centered system of refracting surfaces, each of which is radially symmetrical—but not necessarily spherical. Under these conditions, chromatic aberration, and regular and irregular astigmatism are ruled out.

No account has been taken of the Stiles-Crawford phenomenon.

GENERAL EQUATION FOR INTENSITY (I) IN THE RETINAL IMAGE

The equations which have been used in this investigation have been derived in much the same manner as Gray, Matthews and MacRoberts[1] have derived diffraction equations for spherical wave fronts and circular apertures. It has been necessary for the present purpose to keep the equations general enough to include all radially symmetrical wave fronts of which a spherical wave may be considered to be a special case.

Although the iris lies in front of the lens, it is satisfactory to use the exit pupil instead and to assume that the space between the exit pupil and the retina is filled with a single homogenous medium such as the vitreous humor which has an index of 1.333 for sodium light. It has also been assumed that the plane of the exit pupil is normal to the optic axis.

In Figure 1, a wave front is just emerging from the exit pupil. The retina lies at a distance (c) from the pole (R) of the wave front.

Each point on the wave front acts as a secondary source of light, and the secondary waves produce a distribution of intensity on the retina. Since this distribution is radially symmetrical with respect to

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*Read before the annual meeting of the American Academy of Optometry, Winston-Salem, North Carolina, December 6, 1948. For publication in the March, 1950, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.
Aided by a grant from the Bausch and Lomb Optical Company for research in Physiological Optics.
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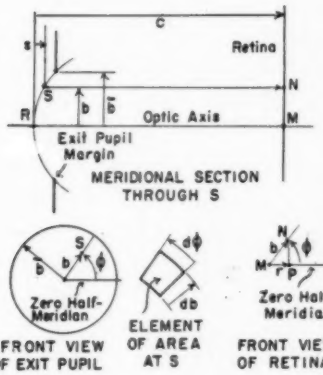

Fig. 1. Geometry involved in computing the distribution of intensity in the retinal image of a point source on the optic axis.

the point M, it can be described by specifying the intensity (I) at points on the zero half meridian at various distances (r) from M. Let P represent any point on the zero meridian at a distance (r) from M.

S represents any point on the wave front lying at a distance (b) from the axis and on a half meridian at an angle ϕ counter-clockwise from the zero half meridian. An element of area of the wave front at S may be written b db dϕ.

The amplitude of the secondary wave arriving at P is inversely proportional to the distance $\overline{SP}$ and directly proportional to the area of the element (b db d ϕ) ; that is, the amplitude of the secondary wave at P is proportional to

$$\frac{(b\ db\ d\ \phi)}{\overline{SP}}.$$

The actual value of the amplitude is also dependent upon the flux density at S and the wave length, but these may be assumed to be constant. The amplitude is also affected by attenuation by the media and by reflection at the various surfaces, but for the present purpose this loss may be assumed to be zero. Since b and r are small with respect to $\overline{SP}$, c may be substituted for $\overline{SP}$.

The disturbance produced at P by the element of the wave front at S is proportional to

$$\frac{(b\ db\ d\ \phi)}{c}\ \sin\left(\frac{\overline{SP}}{\lambda}-\frac{t}{T}\right),$$

when the disturbance at S is zero. In this equation λ represents wave length in the vitreous humor, and T the period.

If the symbol Ψ is used to represent the path difference between $\overline{RP}$ and $\overline{SP}$,

$$\overline{SP} = \overline{RP} + \Psi, \tag{1}$$

and the expression for the disturbance at P produced by the element at S may be rewritten as follows:

$$\frac{(b\ db\ d\phi)}{c} \sin 2\pi \left[\left(\frac{\overline{RP}}{\lambda} - \frac{t}{T} + \frac{\psi}{\lambda}\right)\right]$$

Since the secondary waves originating at the primary wave front are all in phase at the points of origin, the total disturbance produced at P″ by all the elements of the wave front is proportional to:

$$\frac{1}{c}\int_0^{2\pi}\int_0^{b} \sin 2\pi \left[\left(\frac{\overline{RP}}{\lambda} - \frac{t}{T} + \frac{\psi}{\lambda}\right)\right] b\ db\ d\phi,$$

or

$$\frac{C}{c}\left[\sin 2\pi\left(\frac{\overline{RP}}{\lambda} - \frac{t}{T}\right)\right] + \frac{S}{c}\left[\cos 2\pi\left(\frac{\overline{RP}}{\lambda} - \frac{t}{T}\right)\right].$$

In the above expression,

$$C = \int_0^{2\pi}\int_0^{b} \cos\left(\frac{2\pi\psi}{\lambda}\right) b\ db\ d\phi, \tag{2}$$

and

$$S = \int_0^{2\pi}\int_0^{b} \sin\left(\frac{2\pi}{\lambda}\psi\right) b\ db\ d\phi. \tag{3}$$

The above expression is a statement to the effect that the disturbance at P″ is equivalent to the sum of two disturbances produced by waves having amplitudes proportional to $\frac{C}{c}$ and $\frac{S}{c}$ respectively. The factors,

$$\left[\sin 2\pi\left(\frac{\overline{RP}}{\lambda} - \frac{t}{T}\right)\right] \text{ and } \left[\cos 2\pi\left(\frac{\overline{RP}}{\lambda} - \frac{t}{T}\right)\right]$$

represent the effect of wave phase upon the disturbances at the time (t).

It follows from this that the intensity (illuminance) I at P is given by the following equation:

$$I = k\left[\left(\frac{C}{c}\right)^2 + \left(\frac{S}{c}\right)^2\right]. \tag{4}$$

In this equation k is a constant which as we shall see later, depends upon the density of the flux in the plane of the exit pupil, and the wave length of the light.

An Equation for Ψ in Terms of s, b, c, r and φ

The point (N) on the retina lies in the same meridian as S at an angular distance φ from the zero half meridian. It also lies at the same distance (b) from the axis as S.

$$\psi = \overline{SP} - \overline{RP} = \sqrt{\overline{SN}^2 + \overline{NP}^2} - \sqrt{c^2 + r^2}\,.$$

Since

$$\overline{SN}^2 = (c-s)^2 = c^2 - 2cs + s^2,$$

and since

$$\overline{NP}^2 = b^2 + r^2 - 2\,br\cos\phi\,,$$

$$\sqrt{\overline{SN}^2 + NP^2} = \sqrt{c^2 - 2cs + s^2 + b^2 + r^2 - 2\,br\cos\phi}$$

$$= c - s + \frac{s^2+b^2}{2c} + \frac{r^2}{2c} - \frac{br\cos\phi}{c}\,.$$

Also,

$$\sqrt{c^2+r^2} = c + \frac{r^2}{2c}$$

Therefore,

$$\psi = \frac{s^2+b^2}{2c} - s - \frac{br\cos\phi}{c}$$

Final Equation for C and S

Substituting the new expression for Ψ in Equation 2,

$$C = \int_0^{2\pi}\int_0^{b} \cos\left[\frac{2\pi}{\lambda}\left(\frac{s^2+b^2}{2c} - s\right) - \frac{2\pi br}{\lambda c}\cos\phi\right] \cdot b\,db\,d\phi\,.$$

If we let

$$\frac{2\pi}{\lambda}\left(\frac{s^2+b^2}{2c} - s\right) = \Omega\,, \tag{5}$$

and

$$\frac{2\pi br}{\lambda c} = x, \tag{6}$$

$$C = \int_0^{2\pi}\int_0^{b} \cos\left(\Omega - x\cos\phi\right) \cdot b\,db\,d\phi\,.$$

This reduces to

$$C = 2\pi\int_0^{b} \cos\Omega \cdot b\,J_0(x)\,db \tag{7}$$

Similarly

$$S = 2\pi\int_0^{b} \sin\Omega \cdot b\,J_0(x)\,db \tag{8}$$

In equations 7 and 8, the term $J_0(x)$ is a Bessel function defined as follows:

$$J_0(x) = \frac{1}{\pi}\int_0^{\pi} \cos\,(x \cos\phi)\, d\phi\,. \tag{9}$$

Values of $J_0(x)$ for different values of x can be secured from available tables.

Evaluation of the Constant, k

The fact that the total number of lumens intercepted by the retina,

$$2\pi\int_0^{\infty} I\, r\, dr,$$

must be equal to the total number of lumens (L) transmitted through the exit pupil, makes it possible to evaluate the constant k. The first step is to evaluate the integral,

$$2\pi\int_0^{\infty} I\, r\, dr.$$

This is easy in the special case in which the wave front is spherical and has its center of curvature located at M. In this case s is equal to $c - \sqrt{c^2 - b^2}$, and it follows from this that Ω is equal to zero and Equation (4) reduces to

$$I = k\left[\frac{C}{c}\right]^2 = k\left[\frac{2\pi}{c}\int_0^{\overline{b}} b\, J_0\,(x)\, db\right]^2.$$

Since

$$b = \left(\frac{\lambda c}{2\pi r}\right) x \text{ (See Equation 6)},$$

and

$$db = \left(\frac{\lambda c}{2\pi r}\right) dx\,,$$

$$I = k\left[\frac{2\pi}{c}\left(\frac{\lambda c}{2\pi r}\right)^2\int_0^{\overline{x}} x J_0\,(x)\, dx\right]^2,$$

where $\overline{x}$ denotes the value of x when $b = \overline{b}$ and is equal to $\frac{2\pi r}{c\lambda}\,\overline{b}$.

Since

$$\int_0^{\overline{x}} x J_0\,(x)\, dx = \overline{x}\, J_1\,(\overline{x}),$$

where $J_1(\overline{x})$ is another Bessel function,

$$I = \frac{4 k \pi^2 \bar{b}^4}{c^2} \left[\frac{J_1(x)}{\bar{x}} \right]^2 . \qquad (10)$$

Since

$$r = \left(\frac{\lambda c}{2 \pi \bar{b}} \right) \bar{x} ,$$

and

$$dr = \left(\frac{\lambda c}{2 \pi \bar{b}} \right) d\bar{x} ,$$

$$2\pi \int_0^\infty I r \, dr = 2 \pi k \lambda^2 \bar{b}^2 \int_0^\infty \frac{J_1^2(\bar{x})}{\bar{x}} d\bar{x}.$$

Since

$$\int_0^\infty \frac{J_1^2(\bar{x})}{\bar{x}} d\bar{x} = \frac{1}{2} ,$$

$$2\pi \int_0^\infty I r \, dr = \pi k \lambda^2 \bar{b}^2 .$$

This as explained above is equal to the total amount of light (L) transmitted by the exit pupil which in turn is equal to the flux density (I_o') in the plane of the exit pupil multiplied by the area of the exit pupil ($\pi \bar{b}^2$). Hence,

$$k = \frac{I_o'}{\lambda^2}$$

THE FORM OF THE WAVE FRONT

In the case of a typical eye which is not corrected for spherical aberration it is necessary to compute the form of the wave front from experimental data. Figure 2 represents Ivanoff's[2] data for the spherical

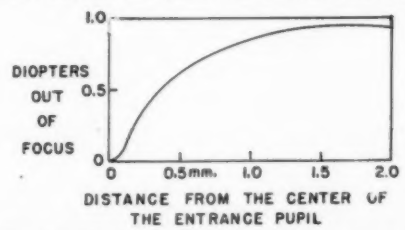

Fig. 2. Ivanoff's data for the spherical aberration of typical emmetropic eye with relaxed accommodation. The ordinates represent the number of diopters that the eye is over (+) or under (—) accommodated for an infinitely distant target for the different zones of the entrance pupil.

aberration for the different zones of the entrance pupil of a typical emmetropic human eye with relaxed accommodation. Although Ivanoff failed to specify the wave length composition of the light, it suffices for the present purpose to assume that the data relate to a wave length of 589 $m\mu$ in air. The ordinates represent the number of diopters that the eye is overaccommodated (plus) or underaccommodated (minus) for an infinitely distant target. The abscissae represent the radii of the different zones of the entrance pupil.

In order to use this data to compute the form of the wave front of a wave emerging from the exit pupil, it is necessary to make certain assumptions about the entrance and exit pupils, the principal planes and the focal points. The assumptions which have been made are based on Laurance's[3] No. 1 schematic eye. In this eye the refractive index (n) of the vitreous is 1.333, the primary focal length (f) is 15 mm. and the secondary focal length (f') is —20 mm.

It has been assumed that the real pupil is centered on the optic axis and lies in a plane which is perpendicular to the axis and tangent to the front surface of the lens. When this additional assumption is made, the exit pupil must lie at a distance of 1.34 mm. behind the secondary principal plane and is 0.93 as large as the entrance pupil.

The relation between the radius (e) of a zone in the entrance pupil and the radius (g) of the corresponding zone in the exit pupil is given by the following equation:

$$g = .93\ e. \qquad (12)$$

In Laurance's No. 1 schematic eye the paraxial focus for a point at an infinite distance on the optic axis falls at the secondary focal point (F'). As shown in Figure 3, G which falls on the optic axis designates

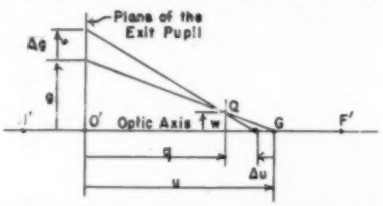

Fig. 3. Geometry involved in computing the position of the tangential foci of the different zones of the exit pupil.

the sagittal focus for a peripheral zone of the pupil at a distance (g) from its center. Although Ivanoff failed to specify what he meant, it may be assumed that the number of diopters that the eye is out of focus is proportional to the distance from F' to G and is equal to $\overline{F'G}/ff'$. The distance (u) from the exit pupil to the sagittal focus for

a given zone of the pupil is given by the following equation:

$$u = \overline{O'F'} + \overline{F'G} \ . \tag{13}$$

Figure 3 also shows the relationship between Δg, Δu and the position of the point Q which is the tangential focus for the given zone of the pupil. Actually the tangential focus is not a single point but a ring of points surrounding the optic axis. The sum total of all these rings of points for the different zones of the pupil form a surface known as the caustic surface. The distance (q) of the point (Q) from the exit pupil is given by the following equation:

$$q = \frac{u}{1 - \frac{g\Delta u}{u\Delta 3}} \tag{14}$$

The distance (w) of Q from the optic axis is given by the following equation:

$$w = \frac{u - q}{u} g \tag{15}$$

Figure 4 represents a section along the axis showing the position, extent and configuration of the caustic surface calculated from the data shown in Figure 2.

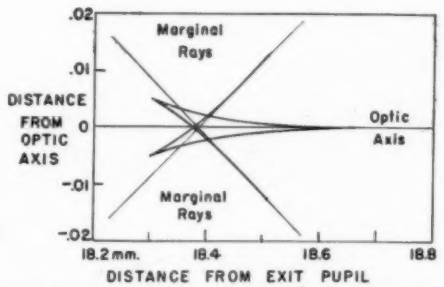

Fig. 4. The position, extent and configuration of the caustic surface computed from the data given in Fig. 2.

In Figure 5 zones of the exit pupil are designated in terms of their distance (h) from the margin of the pupil, and their width is specified in terms of Δh. As indicated in this diagram, m, Δm, h and Δh are negative quantities.

Since

$$\frac{\overline{ST}}{\Delta h} = \frac{q - m}{q}$$

and since

$$\overline{ST} = \Delta m\,(\cot\Theta + \tan\Theta) = \Delta m\left(\frac{u}{g} + \frac{g}{u}\right) = \frac{u^2+g^2}{ug}(\Delta m),$$

$$\Delta m = \frac{ug\,[q-m]\,\Delta h}{(u^2+g^2)\,q}, \tag{16}$$

where

$$m = \sum_{0}^{h} \Delta m .$$

The distance $\bar{s}$ from the pole (R) of the wave front to the center of the exit pupil (0′) is

$$\bar{s} = -\sum_{0}^{\bar{h}} \Delta m,$$

where $\bar{h}$ is the distance from the margin to the center of the pupil. It follows therefore that

$$s = \bar{s} + m = \sum_{0}^{h} \Delta m - \sum_{0}^{\bar{h}} \Delta m \tag{17}$$

The distance (b) of S from the optic axis is given by the following equation:

$$b = \frac{u-m}{u} g \tag{18}$$

THE POSITION OF THE RETINA

In describing the spherical aberration data in terms of the over or under accommodation for the different zones, one assumes that the paraxial focus falls on the retina, but in order to investigate the effect of throwing the eye out of focus, one can shift the retina in a fore and aft direction, and hence distributions can be computed for various values of c.

Computation of C and S

Having determined the values of s for different values of b, one can compute the corresponding values of Ω.

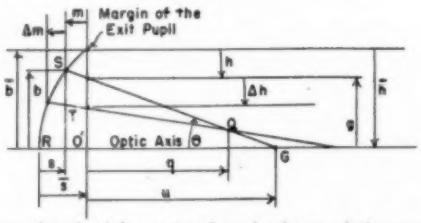

Fig. 5. Geometry involved in computing the form of the wave front of a wave emerging from the exit pupil.

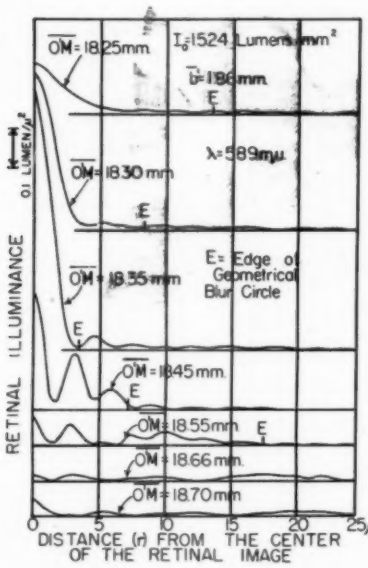

Fig. 6. Distributions of intensity in the retinal image for a point source with the retina lying at different distances ($\overline{O'M}$) from the center of the exit pupil. Distance (r) from the center of the retinal image is specified in terms of microns (μ) and retinal illuminance is specified in terms of lumens per micron (μ) squared.

A special type of product integrator has been constructed to compute values for C and S for various values of r and c. In order to carry out this operation it is necessary to construct two graphs, one representing a plot of b cos Ω and b sin Ω against b and the other a plot of $J_0(x)$ against b. The product integrator computes the product of the ordinates on the two graphs and integrates these products between the limits of b = zero and b = $\overline{b}$. In the present paper the value of $\overline{b}$ has been kept constant at 1.86 mm.

Computation of I

The next step is to compute values of I in accordance with equation 4.

Intensity Distributions for Various Positions of the Retina

Figure 6 shows calculated distributions of intensity for various positions of the retina. The position of the retina is specified in terms of its distance ($\overline{O'M}$) from the center of the exit pupil. This makes

it possible to correlate the data with the caustic surface shown in Figure 4. The letter E indicates the edge of the geometrical image which corresponds to the marginal ray or caustic surface depending upon which is farther from the optic axis. It should be noted first of all that there are no peaks of intensity in the distributions which correspond to the intersections of the caustic surface with the retina, and consequently the caustic surface is of little value in predicting the distribution of intensity on the retina.

The sharpest image is obtained when the retina is placed somewhere between 18.30 and 18.35 mm. from the center of the exit pupil and lies just in front of the intersection of the marginal rays.

REFERENCES

1. A. Gray, G. B. Matthews, and T. M. MacRoberts, Bessel Functions, 178-180 (1931).
2. A. Ivanoff, J. O. S. A., 37, 730-31 (1947).
3. L. Laurance, Visual Optics and Sight Testing, 452-455 (1926).

ABSTRACTS

A COMPARISON OF ELECTRICAL AND PSYCHOPHYSICAL DETERMINATIONS OF THE SPECTRAL SENSITIVITY OF THE HUMAN EYE. Lorrin A. Riggs, Richard N. Berry, and Matthew Wayner, Psychological Laboratory, Brown University, Providence, Rhode Island. J. Opt. Soc. Am. 39, 427 (June, 1949).

By means of an electrode mounted on a contact lens the electrical responses of the retina to stimulation by filtered lights of various dominant wave lengths were measured. The very slight difference in electrical potential between the cornea and the stimulated retina was electronically amplified, and the output fed to a loop oscillograph galvanometer which photographically traced the relative positive potential of the cornea above the ground potential of the retina. (An electrode applied to a point on the forehead was the ground potential.) The potential differences measured ranged from 58 to 500 microvolts, approximately.

The spectral sensitivity data were computed in terms of the intensity of stimulation necessary at each wave length to arouse an electrical response of a given small magnitude. Two sets of data were obtained, for dark-adapted and for light-adapted eyes. The responses for the right eyes of five observers were measured.

Comparable data in parallel experiments were obtained by psychophysical experiments of the classic type, using the same filter combination and methods of computation as for the electrical experiments. It was found that the electrical data, both for photopic and scotopic eyes, agreed much more closely with the psychophysically determined scotopic sensitivity curve than with the photopic. Lights of shorter wave-length, in the blue region of the spectrum, were found to be slightly more effective in creating electrical response than predicted by the scotopic sensitivity curve.

BERNARD ROSETT

MONOCULAR ANTERIOR CORNEAL STAPHYLOMA CORRECTED WITH CONTACT LENS WITH RESULTANT BINOCULAR FUSION—A CASE REPORT*

Howard F. Haines†
Columbus, Ohio

CASE HISTORY:

Patient has no headaches or discomfort. The right eye has been blurred for some years, getting progressively worse. Patient went to an oculist who diagnosed the case as cataract, and sent her to a local ophthalmologist for verification and surgery. He felt the case was corneal rather than lenticular and referred her to the writer for contact lens investigation.

Her health is excellent, except for a chronic sinus condition, which the patient states has been treated for some time, with indifferent success. She is 42 years of age, intelligent, realizes that something rather serious is wrong with her right eye, that it has been getting progressively worse and she will do anything possible to cooperate in a correction. There are no recent illnesses, and she appears to be nervously stable. Teeth are normal. There is no family history of poor vision until advanced age, or other unusual conditions.

She is a housewife: has numerous contacts: would like to do a considerable amount of reading and sewing.

COMPLAINT:

Patient is worried about the poor vision in her right eye, somewhat worried about the outcome of an operation, but will do anything to help improve her condition.

PRELIMINARY FINDINGS:

Lids and sclera are normal. Cornea is normal O. S. but questionable O. D. With anterior illumination there is the appearance of a large dark area in the lower two-thirds of the pupil, with a pinkish reflex above.

Versions, rotations, and pupillary reactions are normal. She con-

*Submitted as portion of the entrance requirements of the American Academy of Optometry, and approved by the examining board. For publication in the March, 1950, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Fellow, American Academy of Optometry. Member of faculty, School of Optometry, The Ohio State University.

verges to 3 inches from the bridge of her nose, when the right eye diverges and suppresses.

OPHTHALMOSCOPY: AND FIELDS:

O. D.—It is impossible to obtain a clear view of the fundus. There is a narrow band at the upper part of the pupil, through which the fundus can be seen with difficulty. It is normal as far as can be seen. The balance of the pupillary area is occluded by a dark shadow. One questions whether it is a distortion of the cornea, an opaque area or a luxation of the lens.

O. S.—Eye grounds are normal and clear with no lens power. The disk is shallow, well defined and of good color. There are no crossing signs or retinal lesions.

Form fields and blind spots were not checked on the ophthalmologist's report that they were normal as far as they could be checked.

ANALYTICAL EXAMINATION:

January 31, 1948.

Visual acuity:

O. D. Less than 20/200.

O. S. 20/20.

Ophthalmometry:

O. D. Badly distorted, approximately, 39 D. —3. D. axis 45.

O. S. 40 D. —0.50 D. axis 180.

Retinoscopy:

O. D. Impossible.

O. S. Plano.

Binocular subjective:

O. D. No improvement. V. A. 20/200.

O. S. Plano to +0.25 D. sph. V. A. 20/20.

Phorias, ductions:

Impossible, suppresses O. D.

CONTACT LENS DATA:

Fitted O. D. with a Feinbloom tangent cone lens No. 4332. This has a cone of 86 degrees angle of opening, a corneal radius of 8.5 mm., a 12 mm. chord, and a temporal flange of 13.2 mm. radius.

With the lens in place, there is a clear view of the fundus, which is clear and quite normal in every respect. Static retinoscopy is +3.75 D. sph., and with a subjective finding of +3.50 D. sph., visual acuity is 20/30.

This lens was worn for three hours and forty minutes without

undue discomfort, and with no appreciable decrease in acuity. Patient was pathetically happy and the ophthalmologist was quite enthusiastic.

The contact lens was ordered from the laboratory, and supplied after minor adjustments and cautions as to problems to be expected.

Phorias, ductions, and fusion were normal as checked by rotary prism and Keystone cards. Positive and negative relative amplitudes of accommodation were 2 D. each.

ORTHOPTICS:

It was expected that some aniseikonia might be present and that fusion might be a problem. This fortunately proved not to be the case. Fusion and stereopsis with the contact lens in the right eye and no correction in the left, were excellent from the start. No training was therefore necessary.

DIAGNOSIS:

Case was diagnosed as a corneal anterior staphyloma by the dark shadow seen with the ophthalmoscope occluding most of the pupillary area, the radical distortion of the mires of the ophthalmometer, and the clear fundus view and good acuity through a trial contact lens.

Prognosis was considered good when the acuity proved to be high with the contact lens and fusion and stereoptic Keystone cards were immediately normal.

Patient was rechecked six months later. Acuity was 20/25+, phorias, ductions, and stereopsis were normal. The contact lens was worn almost constantly, sometimes from six to seven hours without removal, and patient was pleased with results.

A contact lens in this case is considered the only possible solution. Its use has restored a patient to normal binocular vision, and greatly improved her peace of mind. It is also felt that progress of the ocular condition may have been retarded or possibly stopped by the support to the anterior surface of the cornea.

SUMMARY:

This patient was diagnosed by an oculist as a cataract case and was referred to an ophthalmologist for surgery. He felt the trouble was corneal rather than lenticular and referred the case to the writer for contact lens investigation. Vision in the affected eye was increased from less than 20/200 to 20/25. Patient is now wearing a contact lens in the right eye with no correction in the left and fusing normally.

74 SOUTH 3RD STREET,
COLUMBUS, OHIO

A CLINICAL STUDY OF TRIFOCAL LENSES*

James H. Grout†
Northern Illinois College of Optometry
Chicago, Illinois

Only during the last decade have trifocal lenses reached their present prominence in the ophthalmic professions. Until the last few years, the trifocal lenses, combining in one eyeglass three segments, one for distance, the second for close reading, and the third for intermediate vision at arm's length, had been considered by many only as an occupational lens for the elderly.

Our clinical findings at the Northern Illinois Eye Clinic over a period of the last 12 months, coupled with our observations of the past seven years, plus the findings of others throughout the country whose reports we have studied and checked, have shown that in actuality trifocal lenses used in the treatment of presbyopia are effective for a much wider group of men and women, and have achieved very effective results in aiding the more advanced stages of this condition.

It is our opinion that a clinical analysis of the application of these lenses as prescribed at the Northern Illinois Eye Clinic can be of value to the practitioner. The following data are therefore offered for study so that this type of lens can be prescribed with the knowledge of certain facts as gathered objectively from case records.

Records of the trifocal wearers studied showed a range in age from 47 to 76 years, with an average age of 58. It was found, further, that 50 per cent of the ages were from 50 to 59 years, with 37.5 per cent being over 60 years and the remaining 12.5 per cent being under 50 years. The preponderance of men patients over women patients was not too significant, with the males comprising 56.25 per cent of the cases.

Our studies also disclosed that while some patients regarded trifocals as experimental, trial and usage proved them a practical tool rather than a deterrent to their work.

The chief complaint of the potential user studied was not specifically indicative of trifocal lenses; although questioning during the taking of these histories would disclose need for such lenses.

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*Submitted on January 10, 1950, for publication in the March, 1950, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

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ANALYSIS OF CASE HISTORIES AS TO PHYSIOLOGICAL FACTOR

In our examination we studied several major findings in an attempt to determine whether or not there was any correlation between those findings and the possible need for trifocal lenses. The results of these studies indicated to us that the only physiological need for trifocals was that of simple advanced presbyopia.

The bifocal addition for near ranged from 1.75 diopters to 2.75 diopters, with the following table showing the distribution of the bifocal "adds":

1.75 D.	—	31.25%
2.00 D.	—	12.50%
2.25 D.	—	25.00%
2.50 D.	—	25.00%
2.75 D.	—	6.25%
		100.00%

The intermediate "add" prescribed in practically all cases amounted to 50 per cent of the bifocal "add" for near.

There appeared to be no significant grouping of cases as related to the distance prescription. This is shown in the following table:

POWER	SPHERICAL	CYLINDRICAL
Plano	3.12%	31.25%
0.25	6.25	18.75
0.50	.0	18.75
0.75	6.25	15.62
1.00	.0	3.13
1.25	18.75	
1.50	6.25	6.25
1.75	18.75	
2.00	3.12	3.12
2.25	6.25	
2.50	6.25	
2.75	3.12	
3.00	3.13	3.13
3.50	6.25	
4.00	3.13	
5.00	6.25	
5.25	3.13	
	100.00%	100.00%

The phoria findings did not show a direct correlation with the need for trifocals as will be seen in the following tables:

PHORIA AT DISTANCE

Ortho	37.50%
0.5 exo.	6.25%
1.0 exo.	12.50%
1.5 exo.	6.25%
2.0 exo.	6.25%
3.0 exo.	6.25%
4.0 exo.	6.25%

1.0 eso.	6.25%
2.0 eso.	6.25%
3.0 eso.	6.25%
TOTAL	100.00%

PHORIA AT NEAR

Not taken	18.75%
1 exo.	6.25%
3 exo.	6.25%
4 exo.	6.25%
6 exo.	6.25%
8 exo.	12.50%
9 exo.	12.50%
10 exo.	6.25%
12 exo.	6.25%
16 exo.	6.25%
18 exo.	6.25%
6 eso.	6.25%
TOTAL	100.00%

The amplitude of accommodation as taken through minus lenses showed such a variation as to be not significant in the prescription of these lenses as shown in the following table:

AMPLITUDE OF ACCOMMODATION

0.25 D	6.25%
0.50	18.75%
0.75	6.25%
1.00	18.75%
1.25	6.25%
1.50	12.50%
1.75	6.25%
2.00	12.50%
2.50	6.25%
3.25	6.25%
TOTAL	100.00%

There was, however, a direct correlation between the amplitude of accommodation as described above and the average bifocal addition for near. The table which follows will show this:

AMPLITUDE OF ACCOMMODATION AND BIFOCAL ADDITION

Amplitude of Accommodation	Average Addition
0.00 — 0.75	2.50 D.
1.00 — 1.75	2.07 D.
2.00 and over	1.87 D.

ANALYSIS OF CASE HISTORIES AS TO OCCUPATIONAL FACTOR

Examinations of the case histories showed that certain specific occupations, businesses and professions were much more likely to find trifocals effective than others. We have summarized herewith the businesses and professions which found trifocals most effective.

It will be appreciated that many occupations and avocations not covered in this list could effectively use such a lens and that only by questioning and analyses of their duties could such need be established.

ACCOUNTANTS (Also bookkeepers, bank tellers, etc.)

Problem: Chief complaint here was that they were unable to read figures from large ledgers while at the same time satisfactorily operating an accounting or calculating machine while sitting in a normal position. Several stated that they found themselves unable to see the details of figures at arm's length and refer to other ledgers without having to change their working position.

Solution: Use of trifocals eliminated fatigue and speeded accounting procedures. Once the patient had adapted to their use, they were found especially effective during periods when much detail work had to be done in brief periods.

APPAREL ARTS WORKERS

Complaint: Patients earning their livelihood by sewing, cutting, stitching and other apparel arts operations encountered difficulty in working comfortably at the required distance, which was usually 2 to 3 feet away from their eyes. It was reported that they had difficulty in accurate cutting or stitching in the arm's length distance range.

Solution: Use of trifocals in the cases reported provided workers with improved vision in the intermediate field through which they could see more clearly. Fatigue caused by extra body and hand motions was sharply reduced and patients reported increased efficiency in the actual operation.

BUTCHERS

Problem: Several patients in this category reported that they had difficulty seeing meat on the block in clear detail from a standing position. A number also stated that they were unable to read the scale in a comfortable normal standing position.

Solution: Use of trifocals made it possible for those in this occupation to see meat on the block more clearly without the need to throw their heads upward and forward in an unnatural position. It also improved reading of the scale.

CLERGYMEN (Including other public speakers):

Problem: The complaint made by clergymen was very uniform. They stated that they were unable to read notes, announcements, etc., from a normal standing position from their lectern without bending over to see from the reading portion of their bifocals. Many stated that they

had to memorize sermons or announcements or to raise their notes up to a normal reading position, which detracted from the effectiveness of their delivery. A bishop and a state congresswoman reported that they had had to have a special pair of glasses made only for the intermediate range, which proved annoying when trying to see the congregation or audience.

Solution: The use of trifocals in almost every case enabled the speaker to see print on the lectern without having to bend down or to raise the notes to his own eye level. Several also stated that they were able to read notes without appearing to be reading, thus becoming more natural and effective on the platform.

DENTISTS

Problem: Principal complaint from dentists was that they were unable to see all the varied types of drills and other instruments on their work platforms and in the cabinets where such instruments, together with filling materials, etc. are kept, while working on a patient.

Solution: Use of trifocals made it possible for them to gain accurate sight of these areas with less inconvenience. In a number of cases special trifocals were designed for dentists with the reading portion above and the intermediate portion below, a factor to which users became acclimated.

DRAFTSMEN, ARCHITECTS, ARTISTS, ADVERTISING LAYOUT MEN

Problem: Patients in this category, involving working at a drawing board or over a table at arm's length, reported that they had to see details at distances beyond the normal reading range. In each case they stated that they had to hunch over the board in an uncomfortable position in order to work effectively.

Solution: Use of trifocals made it possible to see the detail anywhere on the board without having to move their bodies unnecessarily.

HOUSEWIVES

Problem: (Patients who were housewives represented one of the numerically largest groups among those examined.) Among complaints reported were the following:

1. Inability to see at arm's length while ironing.
2. Difficulty in seeing identification and other labels on bottles, cans, bags, etc., from medicine and kitchen shelves.
3. Difficulty in reading recipe book on the kitchen table while standing.
4. Difficulty in using sewing machine.

Others reported their inability to see the cards played or the dummy hand when playing bridge in the evening.

Solution: Use of trifocals provided vision at arm's length, reduced the seeing problem in many household tasks.

INDUSTRIAL MACHINE OPERATORS (Among the patients were men in the following categories: Drill and punch press operators and lathe operators.)

Problem: Patients in these occupations complained of being unable to see fixtures clearly and inability to insert metal stock into machines easily and efficiently because of lack of good vision at arm's length. Those wearing single vision lenses for the arm's length distance found they could not read the micrometer or blueprints accurately.

Solution: Use of trifocals permitted them to see clearly at arm's length distances where the major tasks were performed, and at the same time to be able to perform the nearer tasks.

MUSICIANS

Problem: Almost universally, musicians reported inability to see music clearly on the stand while performing. It was reported that even though they used a special pair of "music glasses" while performing, this additional pair did not make it possible to see both the music and the director on the podium. The amateur pianist complained of inability to read music through the regular bifocal lens.

Solution: In most of the cases, use of trifocals completely eliminated the difficulty in seeing music at intermediate range and the director at a distance, without having to assume uncomfortable, unnatural positions.

OPTOMETRISTS AND PHYSICIANS

Problem: A number of optometrists and dispensing opticians themselves reported difficulty in using their refracting instruments, such as the phoropter and retinoscope, and in taking facial measurements while fitting spectacles. In using the phoropter or in dispensing they were forced to assume an awkward position with the head thrown back in order to do the most effective work.

Physicians stated that they had difficulties in using the head mirror employed to throw light down the oral cavity or into the ear or nose, since the aperture of the head mirror only enabled them to see through the upper portion of their bifocals.

Solution: Trifocals were found to be effective in these cases with some lenses prescribed with the intermediate segment in the upper portion of the lens instead of in the central area.

POSTAL EMPLOYEES

Problem: Major problem reported was in sorting mail either in post offices or on railway mail cars. In the latter particularly, patients reported that lack of intermediate vision made their work of sorting mail into long rows of slots or collection bags, often overhead, or to the side, most difficult.

Solution: Trifocals helped considerably, particularly in the sorting of mail by city and zone.

SALES PERSONS

Problem: (In this category patients included shoe clerks, grocery clerks, drug clerks, and department store clerks.) Many had difficulty reading labels on boxes or commodities on shelves not directly in their line of view or at eye level height. They had either to stand on a ladder to get up to proper eye level or to raise the head to an unnatural position to see through the reading segment of bifocals. Several also reported difficulty in making out sales slips while standing in a normal position.

Solution: Use of trifocals enabled them to see prices and to read and identify labels at an intermediate distance without unnecessary motion or head movement.

In addition to the occupational needs noted above, observations as they pertain to general use were made. One complaint registered by a number of women was that they found that they were unable to window shop since the distance at which they wished to see was too close for clarity through their distance portion, while, at the same time, it was beyond the ordinary bifocal range.

Another common complaint had to do with the fact that a person standing behind a desk or table could not, at the same time, read any material on the desk without leaning over and tilting his head back.

Others registered the complaint that while sitting at a desk or table they were unable to see clearly the articles or printed matter on the desk except for a relatively small area immediately in front of them.

The trifocal lens was also found to be advantageous in the course of ordinary conversation, since the wearer could see clearly the face of the person with whom he was speaking.

We can assume that practically all trifocal patients have previously used bifocals. We feel that it is wise to take a little time to explain to the patient why it is that although originally his bifocal lenses had sufficed for all of his seeing needs, trifocals would, in his case, now be more satisfactory. In this connection, it is important to explain that his need for trifocals has been brought about by the same physiological

process that had made necessary his bifocal lenses several years previous, and that this change in his ability to see clearly at the desired distances would have taken place independently of the fact that he had worn lenses prior to this time.

It is thought that by explaining that presbyopia is a condition which is progressive and which is in no wise abnormal, trifocal (or bifocal) lenses are more readily acceptable in the patient's mind. Some explanation of the process of presbyopia itself is recommended, accompanied by an explanation of what the patient has experienced prior to their use and what they may expect to experience after wearing such a lens. It is, of course, important also to explain and demonstrate the proper use of a trifocal lens, at the same time showing which areas of the lens are to be used for seeing at certain distances and the limitations thereby imposed.

We may conclude from this study that careful questioning is important in the screening of trifocal cases. Secondly, most any occupation will show at least some need for this type of lens, although occupation in itself is not the all-important factor. Thirdly, it appears that the ordinary bifocal addition should be at least 1.75 D. before a trifocal can be expected to adequately fulfill its function, and fourthly, there appears to be no relationship between the distance prescription, the phoria findings, or even the amplitude of accommodation, when taken as described, except for the fact that this last factor does show a correlation with the power of the bifocal addition to be prescribed.

We do not, therefore, believe that our analytical examination can be used to determine a trifocal case, except that it will, of course, disclose the fact that the patient is presbyopic. Instead, the proper application of trifocal lenses should come from the practitioner's professional judgment, coupled with the careful indoctrination of the patient in their use.

AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY
Established 1924

Vol. 27 MARCH, 1950 No. 3

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Annual Subscription, $5.00 in Advance; Canada, $5.50; Foreign, $6.00; Single Copies, 50c.

Original papers, scientific communications, clinical reports, books for review, and correspondence should be sent to the editor. Subscriptions and applications for single copies should be addressed to the circulation manager. Copy of advertisements must be sent in by the first of the month preceding their appearance. Communications with reference to advertising or other journal business should be addressed to the advertising manager. Academy correspondence should be addressed to Dr. Carel C. Koch, Secretary of the American Academy of Optometry.

Published Monthly by the
AMERICAN JOURNAL OF OPTOMETRY PUBLISHING ASSOCIATION

The American Academy of Optometry and the publishers of this journal have no objection to the reprinting by other magazines of any of the articles in this issue, provided such reprints are properly credited to the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

ANNOUNCING A SERIES OF PAPERS ON OCCUPATIONAL VISION

During 1947-1948 the New Jersey Chapter, American Academy of Optometry, sponsored a series of lectures, dealing with occupational vision, or as it is sometimes called, industrial eye work. This series of well attended meetings gave the members of that chapter a working knowledge of the problems encountered in a properly conducted visual program in industry and they were rewarded with factual information relating to this important phase of visual care. This series of technical papers, each by a specialist in his field, has been assembled by Dr. John R. Wittekind,* consultant on occupational vision, and chairman of the committee on occupational vision of the New Jersey Optometric

*Optometrist, Fellow, American Academy of Optometry.

Association and will now be presented to the profession in succeeding issues of this Journal.

We are pleased to present this factual material to readers of this publication. We do so through the cooperation of the New Jersey Chapter; Dr. Andrew Fischer, Executive Secretary of the New Jersey Optometric Association and Dr. Wittekind.

As an introduction to this excellent series of papers Dr. Wittekind says:

"It may be futile, but it is undeniably fascinating to conjecture what this civilization might have been without the services of the eye professions.

"Suffice it to say that our civilization, as we know it, would have been appreciably retarded had not ophthalmic lenses been invented, and men trained to apply them to individual needs.

"When the matter of familiarizing the profession with the various problems related to occupational visual work was first broached to the writer by the late Charles O. Cozzens a number of years ago, it was well understood that while the profession had much to offer as regarded alleviation and correction of ocular ills and deficiencies, it was necessary to gain the viewpoints, experiences, and cooperation of all the other groups engaged in allied work in industry. Consequently, when Dr. Julius Neumueller, then chairman of the New Jersey Chapter, American Academy of Optometry, at the request of the membership, asked the writer to inaugurate a program for the Chapter, leaders in the various fields of lighting, painting, safety, personnel, manufacturers of lenses and instruments, health, government and specialists within the field of optometry, were contacted and a program outlined. The lectures began September 10, 1947, and ran through to June 9, 1948.

"Through the efforts of Dr. Philip Jackman, a Fellow of the Academy, and director of the department of education of the New Jersey Optometric Association, the members of this Association were invited to attend the lectures. Still later, this endeavor became the program for the Optometric Institute.

"Dr. Andrew Fischer, Executive Secretary of the New Jersey Optometric Association, has been largely responsible for whatever success these efforts may produce, by his unstinting help and encouragement from the beginning of the course of lectures to the present time, and for helping to prepare these papers for publication.

"One of the finest pieces of work, and a definite contribution to the literature, is the *Bibliography* by Dr. R. M. Hall, of Cleveland, Ohio, which we hope will be published as a supplement at the close of this

series of papers. It is with the greatest of pleasure and appreciation that we are privileged to include this excellent contribution.

"Optometry, the profession, by cooperative efforts such as this, demonstrates its awareness and interest in the problems of the civilization in which it lives."

To this introduction we are adding as the foreword to this series of papers the comments of Mr. Howard P. Wall of the American Optical Company in discussing this material and the New Jersey symposium on this subject.

"Industrial visual efficiency and safety is a comparatively new practice in the field of eye work. Eye safety practices date back less than half a century, and visual efficiency programs scarcely more than two decades.

"Professional participation in industrial visual work is equally as new, and relatively few professional people in the ophthalmic field have shown any interest in this important work until the past decade. Therefore, in my opinion, meetings such as these, demonstrating a positive interest in the problem by the optometric profession unquestionably will lead to more active participation in the future.

"In contemplating the work of the past, and attempting to judge the future, it is well to examine the program between the beginning of the safety movement in 1911; the situation as we find it in 1948; and the years ahead.

"During this period, industrial medicine grew from a position of questionable acceptance to one of complete acceptance, both by the public and the profession.

"True, some individuals equipped with more business acumen than ethics attempted to engage in industrial visual work by means of surveys. As was expected, these were not successful because of the inherent lack of professional control. Consequently, these practices were eradicated almost as quickly as they were started, by the pressure of public opinion. If any good was accomplished by these groups, we can concede one thing, and that is, that such surveys demonstrated to both the profession and industry that many of our workers were in need of eye attention. About this time also, it became quite apparent that a definite relationship existed between inefficient eyes and accidents. Certain far-seeing individuals in both optometry and ophthalmology studied the problem and by their contributions verified the fact that a definite relation did exist between the performance of work and efficient eyes.

"Even with these facts known, it is interesting to note that neither

ophthalmology nor optometry has made any formal approaches educational-wise to study the problem. I know of no institution teaching optometry or ophthalmology, having a formal course in industrial or occupational eye work. Our present knowledge is distinctly the result of the work of a very few people in the optometric and ophthalmologic professions. The signs point, however, to the schools including such work in their curricula in the future.

"During the past few years, a large segment of our working population has come under the influence of the industrial eye-care services. In the years ahead more and more workers will be provided with visual programs. The progress of industrial, or occupational optometry will be in proportion to the ever increasing recognition of the importance of good vision for workers' maximum visual efficiency, maximum productivity, minimum spoilage, and highest earnings.

"As we have stated above, this has been the result of education and demonstration of good visual work by a few members of the profession. Naturally, under such circumstances the growth has been slow, and large participation in industrial visual efficiency work will not occur overnight. Both industry and the professions must be educated concerning the advantages of conservation of vision measures, and should continue to prepare its members in the needs of industry. Meetings such as these, coupled with the knowledge gained by the men already in the field, should naturally lead to active participation by the educational institutions of the professions.

"I can see a completely new field of endeavor for your young men as a result of such planning and action. There is the distinct possibility that the profession of optometry will be offered the same advantages that some of the larger industries are offering the young physicians in industrial medicine.

"The successful managers of business today, recognize personnel, accident prevention, time study, job analysis, quality control, merit rating, job evaluation, and employee training programs. It is altogether possible that the highly important function of industrial visual efficiency, can and will be added as a recognized management tool."

The Academy and optometry in general will benefit by the publication of this material. It will focus attention on this somewhat neglected sphere of optometric activity and introduce the subject to many optometrists who have given it but little thought.

We are appreciative of this opportunity to present these papers. The first of these by Mr. Daniel L. McKeen appears in this issue. We

look forward with pleasure to publishing this entire series of papers in succeeding issues.

CAREL C. KOCH

AXIAL LENGTH OF EYES AS A FACTOR IN REFRACTIVE ANOMALIES

Stenstrom (1946) studied (1) the radius and refractive power of the cornea, (2) the depth of the anterior chamber of the eye and its relation to the refractive power of the eye; (3) the crystalline lens and its relation to refractive variations, and (4) the effect of the axial length (anterior posterior diameter of the eye) in relation to existing refractive errors.

X-rays were used by Stenstrom to measure the anterior-posterior axis of the living human eye. This is the first time these measurements had been taken on hundreds of subjects and these findings correlated with other known refractive data of the same subjects. Stenstrom used this wealth of material to determine the effects of variations in the axial length of the living eye on the refractive status of that eye.

Among optometrists, ophthalmologists and scientists it has long been supposed that variations in the anterior-posterior axis of the eye caused considerable variation in the refractive power of the eye and in the manner in which this refractive condition had to be corrected. The successful Stenstrom research eliminated the old suppositions and presented the ophthalmic world with data which indicate that myopia and hyperopia are most likely to be related to variations in the axial length of the eye. His findings indicate that about 70 per cent of these problems originate with these variations.

This important study by Stenstrom was translated from the original German to English by Dr. Daniel Woolf, School of Optometry, Columbia University. This excellent translation was first published in this Journal (1948) where it ran in six chapters which included the tables and drawings from the original manuscript. This material was very well received in English speaking countries where the original Stenstrom manuscript, while known, was not readily available.

The Woolf translation has now been reviewed by Stenstrom and the American Academy of Optometry has authorized the printing of the entire material as a special Academy project. This masterful contribution to our literature by Stenstrom, as translated by Woolf, is now available in monograph form. 72 pages illustrated, board covers, $1.00, including all data, tests, observations and conclusions from the original.

This very significant research study adds tremendously to our basic knowledge of refractive causes and their correction. The data presented by Stenstrom will find a wide audience among optometrists and ophthalmologists in all English speaking countries, and will become part of the basic science which surrounds our refractive procedures.

CAREL C. KOCH

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

RESEARCH PROJECTS COMMITTEE

GRANTS-IN-AID FOR 1950

At the annual meeting of the Academy in Cleveland the following grants-in-aid were approved by the Research Projects Committee and the Executive Council for 1950:

1. $150.00 to the School of Optometry of the University of California to help defray the cost of building special apparatus to be used by Dr. Robert Harrigan in his search for a method or methods whereby the relationship between accommodation and convergence may be altered. This investigation is fundamental in nature. There have been a number of reports in the optometric literature in which the claim has been made that this relationship is a learned one and that various methods of visual training or the prescribing of lenses will alter the relationship between accommodation and convergence. It has been found, however, by a critical analysis of the data given in these reports that the ratio between these two functions has not been significantly changed. Consequently, the question, "Can the relationship between accommodation and convergence be altered?" cannot be answered positively. It is hoped that Dr. Harrigan's investigations will help find the answer to this question.

2. $500.00 to the Los Angeles College of Optometry to be used by Dr. G. C. Fitzgerrell in the development of apparatus for electroencephalographic field studies.

Objectives

(1) To determine whether any of the electrical disturbances created in the normal "brain wave" pattern by the flashing of a light in the subject's eye can be used in measuring the visual fields.

Two such effects are now known, and either might be used in the measurement of the subject's visual field:

A. Randon spikes associated with the flashing of light in the subject's field of vision.

B. "Driving" effects in which the normal brain frequencies are synchronized with the flash frequency of the stimulating light source.

(2) To determine if any of the commonly applied optometric tests are associated with electroencephalographically recognizable changes.

(3) To determine the practicability of applying scanning techniques to the electroencephalographic study of visual fields. Such methods, if applicable, would permit essentially constant observation of the E. E. G. determined field, possibly permitting observation of transient field contractions, and expansions, or local fluctuations. Application to the study of the presumably variable fields of certain hysterical cases suggests itself. Increased speed and reliability in the taking of field studies seems a likely result, since there is no instruction time involved and no time lost in plotting the individual meridians. Such a device would seem to lend itself to mass field studies for the above reasons.

(4) Development of E. E. G. field study equipment: It should be understood that fields determined by this method may not, and need not necessarily be related in any simple manner to the fields determined by existing clinical methods.

Whether the fields are similar or differ is interesting but immaterial from a research point of view. From a clinical point of view it is only necessary that the findings can be correlated to norms and to clinical deviations from that norm.

3. $500.00 to the Los Angeles College of Optometry to be used by Dr. Monroe J. Hirsch for his work in myopia and statistical studies. Dr. Hirsch is writing a monograph on myopia which will include a critical analysis of all our knowledge to date about this controversial subject. In addition, Dr. Hirsch is engaged in various statistical studies of optometric data which do not necessarily apply directly to his work upon myopia.

MEREDITH W. MORGAN, JR.

LOCAL CHAPTER ACTIVITIES

NORTH CAROLINA CHAPTER

The North Carolina chapter elected the following new officers to serve for 1950: President, Dr. T. E. Donoghue, Wilson; vice president, Dr. J. T. Campbell, Winston-Salem; secretary-treasurer, Dr. John D. Perry, Jr., Winston-Salem; Council members elected were Dr. John

R. Schafer, Statesville; Dr. J. O. Baxter, Jr., Beaufort; Dr. R. N. Walker, Winston-Salem.

SECTION APPOINTMENTS

CONTACT LENS SECTION AND EXAMINING BOARD

This committee is responsible for the program of the contact lens section at the 1950 annual meeting, and for examining applicants for certificates in contact lens fitting. The men appointed are as follows:

Dr. John C. Neill, Philadelphia, Pennsylvania, chairman; Dr. Isadore S. Finkelstein, New York, New York; Dr. Meredith W. Morgan, Jr., Berkeley, California; Dr. V. J. Ellerbrock, Columbus, Ohio; Dr. Arthur E. Hoare, Los Angeles, California; Dr. Irving P. Filderman, Memphis, Tennessee.

SECTION ON PATHOLOGY

The following men have been appointed to take charge of the pathology section:

Dr. William O. Vivian, Media, Pennsylvania, chairman; Dr. E. J. Schoen, Chicago, Illinois; Dr. W. S. Brent, Barberton, Ohio; Dr. Ralph E. Wick, Rapid City, South Dakota.

SECTION ON ORTHOPTICS

The following Academy members have been appointed to plan the 1950 section meeting on orthoptics:

Dr. J. Donald Kratz, Souderton, Pennsylvania, chairman; Dr. Daniel Woolf, New York, New York; Dr. Henry Hofstetter, Los Angeles, California; Dr. S. Winfield Smith, Newark, Delaware; Dr. I. M. Borish, Kokomo, Indiana; Dr. Milton N. Chodroff, Brooklyn, New York; Dr. Monroe J. Hirsch, Los Angeles, California; Dr. Arthur Jampolsky, San Francisco, California.

SECTION ON ANISEIKONIA

Appointed to plan the aniseikonic section meeting in 1950 are:

Dr. Harold Fisher, Mt. Kisco, New York, chairman; Dr. O. L. McCulloch, Holyoke, Massachusetts; Dr. Kenneth Stoddard, Berkeley, California; Dr. V. J. Ellerbrock, Columbus, Ohio; Dr. Leo F. Madigan, Boston, Massachusetts.

REPORT OF THE COMMITTEE ON NOMENCLATURE AND STANDARDS

The chairman of the committee made a visit to the West Coast during the summer of 1948, and had occasion to discuss problems of the committee with Dr. Robert Graham, who is one of the members. Dr. Graham, prior to his appointment to this committee, was working on a problem which concerns the work of this committee, and since his appointment has published a paper with Mr. George Safonov entitled "On the Prismatic Properties of Ophthalmic Lenses."[1] A brief report of this work was presented by Dr. Graham in a paper[2] to the American

Academy of Optometry at the meeting in Winston-Salem. The problems of the committee were also discussed with Dr. Julius Neumueller, the other member of the committee, at the meeting in Winston-Salem.

The committee has undertaken to prepare a preliminary draft of a report dealing with the measurement of vertical imbalance and the specification of vertical imbalance in different parts of the field of view. It has been hoped that there might evolve out of this work a system of coordinates for specifying vertical imbalance which could be correlated with previous work of this committee in connection with the specification of cyclophoria,[3] torsion,[4] and direction of regard,[5] and also with the system developed by Safonov and Graham for dealing with prismatic effects in lenses and also with the systems developed by Ames, Ogle, and Gliddon, and by Luneburg for dealing with problems of space perception. A number of nomographs have been worked out for converting data from one system of coordinates to another, but the preliminary draft of the complete report has not been finished.

ROBERT GRAHAM
JULIUS NEUMUELLER
GLENN A. FRY, Chairman

[1]George Safonov and Robert Graham, on the Prismatic Properties of Ophthalmic Lenses, J. O. S. A., 39, 406-408 (May, 1949).
[2]Robert Graham, Notes on the Precise Placement of Bifocal Segments, Amer. Acad. Optom., 26, 101-102 (March, 1949).
[3]Definition and Measurement of Cyclophoria with Converged and Elevated Lines of Sight, Special Report No. 3, Committee on Nomenclature and Standards, Amer. Acad. of Optom., 24, 489-493 (October, 1947).
[4]Definition and Measurement of Torsion, Special Report No. 2, Committee on Nomenclature and Standards, Amer. Acad. of Optom., 24, 329-334 (July, 1947).
[5]Specification of the Direction of Regard, Special Report No. 1, Committee on Nomenclature and Standards, Amer. Acad. of Optom., 22, 351-360 (August, 1945).

BOOK NOTICES

VISION—ITS DEVELOPMENT IN INFANT AND CHILD. Arnold Gesell, M. D.; Frances L. Ilg, M. D.; Glenna E. Bullis; Assisted by Vivienne Ilg, O. D. and G. N. Getman, O. D. Published by Paul B. Hoeber, Inc., Medical Book Department of Harper & Bros., New York, New York. 329 pages, 72 illustrations. $6.50. 1949.

This book represents a report of researches on the vision of children from birth to the age of 10 conducted at the Yale Clinic of Child Development. The introduction tells the reader about the Yale Clinic, some of the techniques used, the importance of vision in our civilization, and includes a synopsis of the evolution of the "Human Action System."

The first section is to some extent material found in other works of the senior author. As in other material emanating from the Yale Clinic, the illustrations are good, and the observations of behavior of infants excellent. The second section titled, "Developmental Optics," is a description of optometric tests performed upon children of different age groups, with some stress placed upon retinoscopic determinations. The final section consists of a summary of the preceding sections.

The first section on the development of the infant, while somewhat wordy and lacking in quantitative data, is for the most part good. The optometrist interested in learning Gesell's views on the "Ontogenesis of Behavior of the Human Infant," will do well to read his Sigma Xi lecture in the American Scientist (Vol. 37, No. 4, Autumn 1949). An even shorter, and equally fine statement of the essence of the study, appears in his two page article in the February issue of the SCIENTIFIC AMERICAN. There is little to be learned from the first section of the book which cannot be gleaned from either of these articles.

The second section is disappointing. Although the material was available and the retinoscope was used, no useful data on refractive state of the pre-school child are offered, although there is great need for such data. The authors mention average refractive state which without a measure of dispersion is of course of no value whatever. Retinoscopic findings are described in terms of *with* and *against* motions, *bright* and *dull* reflexes, but the working distance of the examiner is not made clear. Judging from the stress placed upon changes in motion, the author's thesis seemingly is as follows: Young children do not instantly fixate upon, nor readily accommodate for, an object directed to their attention; when they do, it is not for long. As the child grows older he fixates and accommodates more accurately, more readily, and can maintain fixation and accommodation for longer periods of time.—This statement may be erroneous, but represents this reviewer's estimate of what the authors demonstrated by retinoscopy.

The following example illustrates one of the weaknesses of the second section. On page 232, in a discussion of phorias among five-year-olds, the following appears, "When the visceral response is changed by adding the *plus* of the far subjective, there is little or no effect on the phoria at *far*. However, at *near*, there is slightly more impact, and, in some cases, the shift may be to less exophoria or more esophoria than shown without the *plus* lens." It should be clear to the optometric reader that such findings are most unusual, yet the authors offer no explanation. The authors undoubtedly did observe a shift toward more esophoria with the addition of plus lens. However, it would seem that

such a finding, difficult if not impossible to explain on physiological grounds, might well be due to inadequacies in the testing procedures or the unreliability of the reports of the five-year old. Whatever the case, this reviewer finds the mention of paradoxical findings without amplification poor textbook style or scientific method.

A number of unsigned reviews of this book have appeared in the optometric press, bearing remarkable similarity one to the other. (THE IOWA OPTOMETRIST, December, 1949; MID-WEST OPTOMETRIC JOURNAL, January, 1950; JOURNAL OF THE NEW YORK STATE OPTOMETRIC ASSOCIATION, January, 1950; ASSOCIATED JOURNAL OF OPTOMETRY, January, 1950). In all of these the opening sentence is, "If ever there was a book written for optometrists, this is it!" In all of these reviews the suggestion is made that "the book is an absolute necessity for reading, rereading and continued study by every optometrist. [This book] deserves a place as a textbook in every school of optometry. Further than that, it should be on the optometrist's reception room table, and extra copies should be available for lending to interested patients." Here then must be a remarkable book, so complex as to require reading and rereading by optometrists, of such far-reaching significance as to be a requisite in optometry schools, and yet of such simplicity as to deserve a place on reception room tables for the edification of the lay public. In all candor, what sort of volume can satisfy these qualifications? The authors do little to clear up the mystery of whom the book was intended to edify. The point of intended audience has been labored, but not without reason, for this represents the primary weakness of the book. The authors, probably attempting to reach an audience of laymen, optometrists, students and others have, as must inevitably happen, succeeded in satisfying the needs of none of these groups.

MONROE J. HIRSCH

NEW WAYS TO BETTER SIGHT. Harris Gruman, O.D. Published by the Telegraph Press, Cameron & Kelker St., Harrisburg, Pa. Illustrated. 207 pages. Cloth. $3.50. 1950.

Gruman has written a book for public consumption dealing with visual problems and those who solve them. In non-technical language the reader is taken behind the scenes and the why and wherefores of ocular care are explained. This new text should have a wide audience.

CAREL C. KOCH.

MANAGEMENT OF BINOCULAR IMBALANCE. By Emanuel Krimsky, M.D., Lea and Febiger, Philadelphia, 1948, 464 pp., 200 illustrations. Cloth. $12.50. 1949.

The title of this book may suggest that it deals with the heterophorias exclusively. However, it is concerned equally with the manifest, as well as the latent, deviations. For many years, the author has advocated a unique approach to the study of oculomotor disturbances. He believes that since the corneal light reflex is the most important objective landmark, the deviations of this reflex should be noted rather than the movements of the eye. All the observable phenomena are therefore presented from this point of view. While this thesis is supported by many good arguments, it is apt to be confusing at first to one accustomed to observe movements of the eye rather than movements of the light reflex, which obviously are in the opposite direction.

The illustrations are excellent. They are diagrammatic and for the most part have been meticulously drawn by the author. They are superb and do what an illustration is intended to do, i.e., make the text clear at a glance.

The first chapter is taken up with a consideration of the corneal light reflex. The next five chapters consider the anatomy of physiology of the ocular muscles. Chapter 6, dealing with the heterophorias, is especially commendable, since the author approaches this subject from the physiologic aspect. Chapter 7 deals with prisms, particularly the aspect of the effect of prisms on the corneal reflex. Chapter 9 is concerned with normal and abnormal binocular vision. The phenomena of normal and anomalous correspondence have been confused by so many writers, because of a wide variety of meanings in the use of certain terms, that most readers look into each new book on ocular muscles with the expectation of being enlightened. The section on the corneal light reflex in retinal correspondence, because it provides a new approach, may lead some into further confusion but it may clarify the subject for others.

Chapters 10, 11, and 12 are concerned with the examination of patients with binocular imbalance. Chapter 13, entitled "Neurological Considerations," deals with supernuclear and infranuclear ocular muscle palsies. Chapter 14 discusses the problem of squint in children. In chapter 15, a number of miscellaneous topics are considered, such as occlusion, face rotation and head rotation, visual skill in aviation and in industry, and ptosis. The last three chapters deal with the use of prisms, the stereoscope and surgical measures of treatment.

As a whole, the book is useful in collecting the author's many contributions to the literature of squint, since nearly all of these are original in their point of view and many of them extremely valuable. This book is not a text for the student beginning his training but the experienced practitioner will find it worth while to obtain the author's different points of view relative to the whole subject of binocular imbalances.

ROBERT E. BANNON

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department: such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

RESERVATION TIME

It's time to reserve your hotel accommodations for a coming outstanding optometric event of 1950—the 53rd Congress of the American Optometric Association—to be held in Minneapolis, June 25, 26, 27, 28. The convention hotel is the Radisson, one of Minneapolis' finest hotels, located in the heart of the shopping and theater district. The Radisson has allotted the Congress 200 guest rooms, as well as exhibit and meeting space, which are considerably more than one-half of the available guest rooms of the hotel. But as more than 750 rooms will be needed for expected Congress delegates, the convention hotel committee has made arrangements with the following excellent hotels in Minneapolis for Congress guests and their families. All of these hotels are within walking distance of the Radisson.

Nicollet, Curtis, Dyckman, Sheridan, Francis Drake, Andrews and Leamington.

Write now for room reservations directly to Dr. Arthur Tillisch, Chairman, hotel arrangements committee, 615 West Lake Street, Minneapolis 8, Minnesota.

ADVANCES IN VISUAL SCIENCE

"A nice job," is our comment on Dr. Harris Gruman's new book for laymen, "New Ways to Better Sight." The book is informative, with technical points well done for the lay reader. Optometrists will do well to see that their local library is supplied with copies, as well as student guidance centers.

The above comment applies to all except Chapter 14. It is puzz-

ling that Dr. Gruman included material on the Bates theory of "better sight without glasses," so universally condemned by optometrists as an unsound and unworkable theory. By including Chapter 14, Dr. Gruman seems to infer that the techniques of Bates are part of standard optometric practice which, of course, they are not. Maybe in the second edition of this book, it would be well to drop Chapter 14.

However, even so, Dr. Gruman has given the profession another valuable book.

OPTOMETRISTS IN THE NEWS

Dr. Henry L. Wolfe, Marshalltown, Iowa, spoke on glaucoma at the Manitoba Optometric Society annual meeting in March, and before members of the New Jersey Optometric Association in February.

The honorary degree of Doctor of Ocular Science was awarded by the Chicago College of Optometry, at its second graduation exercises, to the following for outstanding service to optometry: *Dr. Ellen Colley, Dr. Jack Copeland, Dr. William C. Ezell, Dr. Eugene Freeman, Dr. Leo Manas, Dr. Harry E. Pine, Mr. Charles H. Thuermer, and Mr. Martin Topaz.*

Dr. Don Klaers, Bemidji, Minnesota, was named "Young Man of the Year," and presented with the Jaycee Distinguished Service award, at the annual Bemidji Junior Chamber of Commerce banquet in January. Recipient of the same award for Greeley, Colorado, is *Dr. Joseph L. Haefeli.*

Dr. Sanford L. Ziff, '48 graduate of Northern Illinois College of Optometry, has announced the opening of an office in association with *Dr. Agnes Sutton Austen*, Miami, Florida. Dr. Ziff will specialize in orthoptics, visual training and reading disabilities.

Dr. H. C. Sherratt, Minneapolis, Minnesota, will speak on visual training at the coming Ohio Valley Congress in Cincinnati, Ohio. Other speakers on the three-day program (April 2, 3, 4) are *Dr. Hans Wallack* of Swarthmore College and *Dr. A. M. Skeffington*, Mexia, Texas.

BEQUESTS

A thoughtful and worthwhile suggestion has recently been made by the American Optometric Foundation: "Remember the A. O. F. in Your Will." We feel the idea speaks for itself. A bequest to the Foundation will help assure continuance of needed research in visual science—sufficient reason for any one truly interested in the welfare of the public and the profession.

ACCREDITATION FOR PACIFIC U

Now on the accredited list of optometric colleges is Pacific University's College of Optometry. The announcement of accreditation was

made in February by the A. O. A. Council on Education and Professional Guidance.

The College was accredited provisionally on December 9, 1945, and has since met the minimum standards set up by the Council.

GRADUATE COURSE IN DISPENSING FOR OPTOMETRISTS

A course in trends in styling of ophthalmic materials will get under way at Los Angeles College of Optometry in April. Dr. Margaret Dowaliby, clinical supervisor in charge of dispensing, will teach the course which is designed especially for practicing optometrists. Dr. Dowaliby will cover not only styling, but optics as related to the modern concept of dispensing. Classes start April 12. Registration fee is $10.00. Further information is available from Dr. Monroe J. Hirsch, Los Angeles College of Optometry, 950 West Jefferson Boulevard, Los Angeles 7, California.

CONTINUOUS SERVICE WITH CONTINENTAL

The Keystone club of Continental Optical Company, Indianapolis, added three more members to its roles at its recent annual dinner. Membership in the club is based exclusively on 20 or more years continuous service with Continental. More than 14 per cent of Continental's employees now belong to the group—a record to be proud of.

NEWS BRIEFS

A forum on visual problems of school children is scheduled for April 22, 23 in Milwaukee. The forum is an annual meeting sponsored by the A. O. A. committee on school visual problems, Dr. Marguerite Eberl, chairman. Examination, diagnosis and correction of school children's visual problems will be covered. . . . Dr. Emmett A. Betts of the Reading Clinic Temple University will be the speaker at the two-day meeting of the Missouri Valley Optometric Society, April 1-2 at Sioux City, Iowa. . . . Pacific University is planning to add an Institute of Visual Sciences to its curriculum. The College of Optometry is to serve as a center for the Institute, according to University officials. . . . Now available for distribution by optometrists is a reprint of the recent WOMAN'S HOME COMPANION article, "What is School Doing to Your Child's Eyesight." The pamphlet was reprinted by the A. O. A. Department of Public Information. . . . Save Your Vision week was highlighted throughout the country by special radio and newspaper stories furnished by Dr. Elmer Soles, director of the Public Information Bureau, and his staff. . . . Reorganized is the Greater New York Optometric Extension Program study group. Dr. Elliott B. Finkelstein, Brooklyn, has been appointed committee chairman.